ESTIMATING THE NUMBER OF ALCOHOLICS IN ONTARIO

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OF ALCOHOLICS IN ONTARIO:
AN ANALYSIS BY COUNTY

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OF ALCOHOLICS IN ONTARIO:
AN ANALYSIS BY COUNTY

by

Brian Rush
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and
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ABSTRACT

This paper provides updated statistics for 1979 on the estimated prevalence of alcoholism in Ontario. Prevalence estimates based on alcohol sales data are presented for each Ontario county, then aggregated to the regional and provincial level. For the year 1976, comparisons are made among prevalence rates obtained from alcohol sales data and alternative procedures based on alcohol-related mortality (cirrhosis, alcoholism and suicide). The data support previous findings by Single (1979a) which show the highest prevalence rates in Northern Ontario and the major urbanized centres in the South. Comparisons of the alternative estimation procedures at the regional level showed that the rates obtained by the alcohol consumption method were the most conservative and the most consistent over time. Regional rates based on alcoholism mortality are subject to the most temporal fluctuation. County variation within regions of the province was the highest in the North and the East and the lowest in the West.

An "alcoholic" is a person who, as a result of the abuse of alcohol, is experiencing serious and recurring personal and social problems or health damage, and who, because of these problems, would benefit from treatment. However, there is a wide range of personal styles and consumption --including occasional light drinking and constant heavy drinking--and the shadings between different levels of consumption are imperceptible. Thus there is no clear line of separation between "hazardous drinking" and "alcoholism."

Although the terms "alcohol dependence" and "alcohol dependent person" are more accurate, "alcoholism" and "alcoholic" are widely recognized words in popular and even clinical use, and are therefore used throughout this pamphlet.

INTRODUCTION

Alcoholism prevalence rates have been calculated for Ontario by Schmidt and Smart (1959), Schmidt and de Lint (1970), Single (1979a) and Single and Giesbrecht (1978). Although these prevalence estimates are useful for research purposes they have two shortcomings for the current planning and allocation of alcoholism treatment resources across the province. First, the last available estimates are for 1976 and thus may be out-dated. Second, these rates are available either for the whole of Ontario or 10 large regions of the province. These units of analysis are too large to permit a number of different geographic comparisons. In this report, 1979 alcoholism prevalence rates are estimated using the county as the basic unit of analysis (see Reference Note 1). This will allow prevalence rates to be estimated for a variety of service jurisdictions such as District Health Councils or the catchment areas of large treatment centres.

A number of techniques have been used to estimate the number of alcoholics in a given geographic area. These include the use of mortality data from liver cirrhosis, alcoholism and suicide (Schmidt and de Lint, 1970; Single, 1979a), survey techniques (Celentano and McQueen, 1978; Cahalan and Room, 1974), treatment data (Lau, 1978), convictions for drunkenness (Bruun *et al.*, 1960), hospital admissions for alcoholism (Schmidt and Smart, 1959), and mean consumption statistics (Ledermann, 1956; Schmidt and

de Lint, 1970; Single, 1979a). Each of these methods tends to be influenced by different types of alcohol problems. For example, liver cirrhosis tends to be more indicative of long term use, suicides are associated with psychological disorders, treatment data are associated with availability of treatment services, and convictions for drunkenness are biased by a predominant skid row element. Thus, the number and characteristics of the persons identified as alcoholic depends to a large extent on the specific techniques employed and the operational definition of alcoholism. Popham (1970) has, however, noted that correlations between various techniques are highly significant. The greater the similarity in the prevalence estimates obtained by a variety of procedures, the higher is one's confidence in each of the methods employed. This section will briefly outline the main criticisms of the various estimation procedures.

Prevalence estimates based on alcohol-related admissions to treatment facilities are limited by several factors. The most limiting aspect of this approach is that a large proportion of alcoholics remain unidentified because they do not seek assistance from alcoholism treatment programs. Since reported estimates of the ratio of non-visible to visible problem drinkers vary from 3:1 (Bennett, 1977; Beigel _et al_., 1974) to 9:1 (Edwards _et al_., 1973; Liban and Smart, 1979) to as high as 20:1 (Smart _et al_., 1980), it is difficult to have confidence in this estimation procedure. Other problems include the variation

in the availability of treatment centres between regions, inaccurate documentation of cases in treatment, and the duplication of caseloads within and across community treatment services (Rush, Graham & Brook, in press).

Estimates of the prevalence of alcoholism which are based on surveys of the drinking habits of the general public have also been criticized. Two specific problems which are associated with this technique are the varying criteria used to define alcoholism, and difficulties in obtaining accurate alcohol consumption data across subjects. For example, Pernanen (1972) reports that survey-based techniques may underestimate alcohol consumption by as much as 50%. In addition a survey instrument that is designed, applied, and refined in one jurisdiction may be quite inappropriate when applied to another jurisdiction which has different drinking patterns, levels of consumption , and a different set of mores about acceptable and unacceptable drinking styles.

Other methods of estimation utilize mortality data due to liver cirrhosis, alcoholism or suicide. The formulas used for each of these data bases are similar in that all employ the total number of deaths, the proportion of each cause of death attributable to alcoholism, and annual death rates from alcoholics with complications (Schmidt and de Lint, 1970). The most widely used of these methods employs a formula based on liver cirrhosis mortality; a procedure pioneered by Jellinek (1947) and later revised and

simplified by Popham (1956).

Popham's (1970) criticisms of the Jellinek procedure focus on the difficulties in obtaining accurate data for the formula. Inaccuracies have been attributed partly to human error and social biases in classifying the cause of death, so that the true incidence of liver cirrhosis death is under-reported in official mortality figures. In addition, trends may be distorted by other transient causes of liver cirrhosis mortality such as hepatitis (Ipsen *et al*., 1952). Popham (1956) and Seeley (1959) have also determined that rates originally treated as constants in the formula are in fact variable. Seeley (1959) has argued further that some values in the formula are derived from clinical samples not representative of all alcoholics.

The criticisms of the Jellinek formula which uses deaths due to liver cirrhosis are also applicable to prevalence estimations that use suicide and alcoholism mortality data. However, two further points deserve mention. First, Single (1979b) has suggested that the relationship between alcoholism and suicide may have weakened over the last 20 years. Secondly, diagnosis of alcoholism as a cause of death may be particularly subject to variable diagnosis and differential recording practices (Schmidt and Smart, 1959; Giesbrecht and McKenzie, 1980).

Another commonly employed technique for estimating the prevalence of alcoholism utilizes alcohol sales data. Using

these data to estimate per drinker rates, it is possible, by applying the Ledermann frequency distribution of alcohol consumption (Ledermann, 1956), to then estimate the percentage of drinkers at various consumption levels. One must establish a criterion level of alcohol consumption as being indicative of alcoholism. Prevalence is defined as the proportion of the drinking population that consumes above this limit. Criticisms of this method of estimation have tended to focus on conceptual and cross-cultural problems associated with the validity of the Ledermann distribution. While a number of empirical studies have confirmed that the distribution of alcohol consumption approximates Ledermann's lognormal curve (e.g. de Lint and Schmidt, 1968) the universality and validity of the distribution remain controversial (Skog, 1977; Duffy, 1977).

There is no consensus in the literature as to which of the above techniques is best. The numerous methods developed are at least partially a result of variability, from one setting to another, of the etiology and character of alcoholism and its associated problems (Single, 1979b). In addition, new methods of prevalence estimation are still evolving. The National Institute on Alcohol Abuse and Alcoholism is currently developing an approach which incorporates incidence rates and all causes of death related to alcoholism (Creative Socio-Medics, 1978). Cleary (1979) has utilized a variety of approaches including indicators of

alcohol related mortality, factor scores on eight indicators of alcohol misuse and gamma scores that control for age, sex and overall mortality. The recent influx of new approaches for estimating the prevalence of alcoholism is indicative of lack of consensus in this area.

Estimating the prevalence of alcoholism for small geographic areas , such as the Ontario counties, poses additional methodological difficulties. The problems outlined above are likely to be exacerbated when the geographical unit of investigation is reduced to the county level. These smaller target units involve considerable variation in the size of the population and consequently in the number of cases (e.g. liver cirrhosis deaths) used in estimating prevalence. Therefore, the margin of error will vary markedly from one county to the next. For many counties, estimation methods based on mortality data are inappropriate since a population base of at least 300,000 is recommended (Popham, 1970). Finally, it is unknown to what extent inter-county differences in variables such as abstainer rates, drinking style and wet versus dry sentiments may bias these indirect prevalence estimates.

In the U.S., an increased demand for alcoholism prevalence estimates for small geographic areas has led to the development of an estimation procedure that draws on national surveys of drinking practices (Promisel, 1979). This procedure, referred to as synthetic estimation, combines local census data with a demographic

cross-classification of problem drinking drawn from a national survey. The integration of these data is used to project the number of problem drinkers in each of several subgroups of the local population. This technique suffers from the problems inherent in using any survey estimates of alcoholism (see above). In addition, several problems exist in employing synthetic estimates of alcoholism prevalence, including the under-enumeration of certain groups in the census, the deviation in local drinking practices from the national average and the small amount of variance in problem drinking that is explained by socio-demographic variables (Furst *et al.*, 1980).

From a methodological and practical viewpoint the most appropriate method of estimating the prevalence of alcoholism for small geographic areas is through the use of alcohol sales data and the Ledermann distribution of consumption (c.f. Furst and Beckman, 1981). Instead of measuring infrequent events, as with alternative methods based on mortality, the alcohol consumption method utilizes mean drinker consumption within each county. Reporting and tabulation errors are likely to be low since the unit (beverage alcohol) is quantified in standardized volumes, sales are supervised (e.g. LCBO) and specified dollar values are attached to each item sold. There are, however, several potential problems in using data on alcohol sales as an estimate of total alcohol consumption. Single and Giesbrecht (1979) list seven possible sources of error in

Ontario consumption figures based on sales data: the use of the 16% conversion factor for wine; unrecorded home production; illicit production or importation; tourism; unrecorded consumption by alcohol industry workers; consumption of non-beverage alcohol; and importation of small amounts for personal consumption.

Unrecorded home production and tourism are probably the most important sources of error in obtaining valid estimates of alcohol consumption in each Ontario county. No adjustments have been made to our county consumption data to account for home production. We have, however, provided a rough approximation of the effects of tourism. The remaining sources of error identified by Single and Giesbrecht (1979) are considered less important for our county analysis. The 16% conversion factor for wine has been eliminated by using more accurate values for translating beverage alcohol into absolute alcohol. Although inter-county variation is likely in such factors as the consumption of non-beverage alcohol, illicit production and importation, consumption by alcohol industry workers and personal importation of small amounts, the cumulative effects of these factors on total county consumption will probably remain quite small (c.f. Single and Giesbrecht, 1979).

The primary purpose of this paper is to present an estimate of the number of alcoholics in each Ontario county for 1979. In addition, comparisons of alternative methods

of alcoholism prevalence estimation (alcohol consumption, alcoholism, suicide and liver cirrhosis) are made at the provincial and regional levels. These comparisions use data from 1966, 1973 and 1976 in an attempt to replicate earlier work by Schmidt and de Lint (1970) and Single (1979a).

METHOD

This section highlights the procedures used in the data collection and analysis. The reader is referred to a more detailed report for more specific information on the methodology (Rush, Macdonald and Geisbrecht, 1981).

Prevalence Estimates Based on Alcohol Sales

Sales data for fiscal years 1975-76 to 1979-80 were obtained for spirits and wine from the L.C.B.O. and for beer from the Brewers Retail. A number of calculations were employed on the data which include: estimations from fiscal year sales to calendar years for the spirits and wine data; conversion of all consumption data from gallons to litres of absolute alcohol; and estimations of independent wine store sales by county.

The Ledermann distribution of alcohol consumption (Hyland and Scott, 1969) was applied to the sales data of each of the 48 Ontario counties. The number of drinkers entered into the estimation formula for each county was based on regional estimates of drinker rates (Smart and Goodstadt, 1976). The proportion of the regional population

that are drinkers range from 78.9%, 79.3%, 80.1%, 81.9% and 84.5% (Metro Toronto outskirts, Metro Toronto, Eastern Ontario, Western Ontario and Northern Ontario, respectively). Alcohol consumption of over 14.7 cl/day (8.6 standard drinks per day) was the point used for the definition of alcoholism. This figure was employed by Schmidt and de Lint (1970) and was derived from consumption rates of clients in a Toronto alcoholism clinic. The percentage of the drinkers which consumed more than this amount was multiplied by the estimated number of drinkers for each county to arrive at an estimate of the number of alcoholics.

Prevalence Estimates Based on Mortality

Mortality data for liver cirrhosis and suicides were obtained from *Vital Statistics* for 1975-1977. Data on deaths due to alcoholism, over this same time period, were provided by special request from the Ontario Ministry of Health. A two year moving average, centred at 1976, was calculated to reduce the effect of extreme, annual fluctuations in these mortality rates.

The formulas for the estimated number of alcoholics, as calculated by mortality data, are all derivations of the Jellinek formula: $A = Pc \times (Dc/Rc)$, where A = total number of alcoholics, Pc = percentage of death attributable to alcoholism, Dc = number of reported deaths by cause, and Rc = rate of death by cause per 10,000 alcoholics (Popham,

1956; Schmidt and de Lint, 1970). Schmidt and de Lint (1970) considered Pc to have values of 1.0, .37 and .25 for alcoholism, liver cirrhosis, and suicide respectively. Analysis of the mortality experience of alcoholics in treatment yielded values for Rc equal to 8.02, 16.53 and 12.39 respectively (Schmidt and de Lint, 1969; de Lint and Schmidt, 1970). In the present study, these values for Pc and Rc have also been employed.

Adjustments to 1979 Prevalence Estimates

The county prevalence estimates for 1979 were based on alcohol sales and the Ledermann distribution. Two statistical adjustments were made to these data.

(a) Tourist Adjustment

Adjustments were made to the 1979 sales data of specific counties in an attempt to account for increases of alcohol consumption due to tourism. This procedure was used previously by Giesbrecht, Brown and de Lint (1977) to account for summer consumption by tourists in northwestern Ontario.

The adjustment procedure first compared summer and winter sales of distilled spirits and wines for each county. Since winter sales of spirits and wines are typically higher than summer sales (due to the Christmas season and a general tendency to drink greater quantities of beer rather than spirits in the summer) it was rationalized that if summer

sales were greater than winter sales, the reversal was due to an influx of non-residents during the summer months. For those counties with summer purchases greater than winter purchases, the yearly sales were reduced by the ratio of winter to summer sales. The consumption of eight counties was reduced by the following ratios: Haliburton (.810), Muskoka (.810), Parry Sound (.866), Manitoulin (.890), Victoria (.899), Bruce (.965), Sudbury District (.993), Prince Edward (.991).

Counties with high tourism rates were compared to the counties selected by our adjustment procedure. The Ministry of Industry and Tourism (1979) ranks 10 regions of the province by their tourist trade relative to size of population. Six of the eight counties adjusted downwards by the winter/summer alcohol sales ratio, were in the two highest ranked tourist regions (Georgian Bay and Lake Ontario). The remaining two adjusted counties (Manitoulin and Sudbury District) are in the Northeastern Ontario region which was ranked sixth. Overall there is a high level of agreement between the counties selected by our adjustment formula and the regions with the highest tourist trade. High tourist areas which remain unadjusted by our procedure were Northwestern Ontario, St. Clair, and Niagara. The combined tourist impact in these regions is much less than the top two regions (about one half). These areas all border the U.S. and may have remained unadjusted due to a more equal distribution of summer and winter tourist trade.

(b) Adjustment to account for variation in prevalence estimates obtained by alternative methods

Alcoholism prevalence estimates based on alcohol consumption are usually lower in comparison to estimates derived from alternative methods. Since the degree of underestimation varies for different areas of the province, regional comparisons that rely solely on prevalence estimates based on consumption may be inappropriate. One way to account for this bias is to adjust the prevalence estimates based on alcohol consumption by the estimates derived from other procedures (c.f. Marshman, 1978).

The adjustment procedure takes the average of the estimates obtained by alcohol consumption, liver cirrhosis, alcoholism and suicide and divides by the number estimated by consumption. This calculation is performed for 1976 for each of 10 regions. An adjustment factor is thus obtained for each region and is applied to all counties located within the region (see Appendix B). The adjustment factor is multiplied by the 1979 county estimate based solely on alcohol consumption, to yield the adjusted prevalence rate. This adjustment increases the prevalence rates for counties in which the alcohol consumption method produces the most severe underestimate relative to other methods.

RESULTS

I. Comparison of alternative methods of estimating the prevalence of alcoholism

In this section, comparisons are made with Ontario prevalence data obtained for different time periods and by different estimation procedures. These comparisons are made first at the provincial level (Table 1) and then for 10 geographic regions of Ontario (Table 2 and Figure 1).

Table 1 shows the estimated number of alcoholics and rates per 1,000 adults as calculated by four methods for Ontario for 1966, 1973 and 1976 (See Reference Note 2). An examination of the estimated number of alcoholics for the three years shows increases for each time period, by every method. However, when controlling for population increases, the rates show a considerable jump from 1966 to 1973 and an apparent levelling off between 1973 and 1976. One exception to this trend is rates calculated by alcoholism mortality which show an increase over each year.

An examination of the rates produced by the different estimation methods shows the closest agreement for 1966 and the worst agreement for 1976. The major source of the recent variability is the higher rates calculated by alcoholism mortality. The results indicate that the comparability of the four methods is deteriorating over time as the percentage difference between the highest and lowest estimates are 15% for 1966, 26% for 1973 and 60% for 1976.

TABLE 1: Comparison of numbers and rates (per 1,000 persons aged 15 and older) of alcoholics in Ontario using four estimation procedures for 1966, 1973 and 1976

YEAR	ALCOHOL CONSUMPTION		LIVER CIRRHOSIS		ALCOHOLISM		SUICIDE	
	N	RATE	N	RATE	N	RATE	N	RATE
1966[1]	118,800	25.0	120,000	25.2	122,200	25.7	136,800	28.7
1973[2]	186,000	32.2	220,900	38.3	234,400	40.6	209,200	36.3
1976[3]	197,052	31.8	235,586	38.0	316,084	51.1	225,634	36.4

[1] Schmidt and de Lint (1970)

[2] Single (1979)

[3] See Table 2 this report

For 1973 and 1976 the rank order of the provincial rates for the different methods was identical: alcoholism yielded the highest estimates, followed by liver cirrhosis, suicide and alcohol consumption. For 1966 the rank order is suicide, alcoholism, liver cirrhosis and alcohol consumption. While there has been some shifting in the rank order over the last decade, prevalence estimates based on alcohol consumption are consistently the most conservative.

Table 2 shows the 1976 alcoholism estimates and rates per 1,000 for 10 regions of Ontario used previously by Single (1979a). Generally the regional pattern of all estimates was similar to that obtained by Single for 1973. The northern areas of the province yielded the highest rates of alcoholism, followed by the major urbanized centres of Toronto and Ottawa-Carleton. The region surrounding Toronto showed the lowest rate.

Regional comparisons of the estimates obtained by the four alternative methods show little deviation from the pattern observed in Table 1 for the province as a whole. Estimates based on alcohol consumption are the most conservative for eight of the 10 regions; estimates derived from alcoholism mortality are the highest in six. Alcoholism mortality yielded substantially higher estimates for Toronto, Ottawa-Carleton and the two northern regions.

Figure 1 compares the 1976 regional alcoholism rates, obtained by the four alternative methods, to those reported

TABLE 2: Comparison of number and rates (per 1,000 persons aged 15 and older) of alcoholics in 10 regions of Ontario using four estimation procedures for 1976[1]

REGION [2]	ALCOHOL CONSUMPTION N	ALCOHOL CONSUMPTION RATE	LIVER CIRRHOSIS N	LIVER CIRRHOSIS RATE	ALCOHOLISM N	ALCOHOLISM RATE	SUICIDE N	SUICIDE RATE
Toronto	50,560	30.49	69,892	42.15	123,753	74.63	62,701	37.81
Region Surrounding Toronto	20,801	27.55	15,053	19.93	19,638	26.01	21,893	28.99
Lake St. Clair	12,100	30.56	16,620	41.97	13,092	33.06	14,276	36.05
Central-West Niagara	8,387	20.70	10,632	38.93	6,546	23.97	10,391	38.04
Central-West Other	23,387	30.10	27,588	35.51	29,302	37.72	23,456	30.19
Southwest: Lake Erie, Perth, Huron	12,041	27.74	14,437	33.26	14,651	33.76	14,780	34.05
East: Ottawa-Carleton	12,284	30.79	17,011	42.64	22,132	55.48	14,931	37.43
East: Other	21,632	34.08	26,021	41.00	25,873	40.77	23,608	37.20
North-Central	19,572	39.16	19,194	38.41	36,783	73.60	18,563	37.14
Northwest and Far North	16,288	44.72	19,138	52.55	24,314	66.76	21,035	57.76
TOTALS	197,052	31.83	235,586	38.05	316,084	51.06	225,634	36.45

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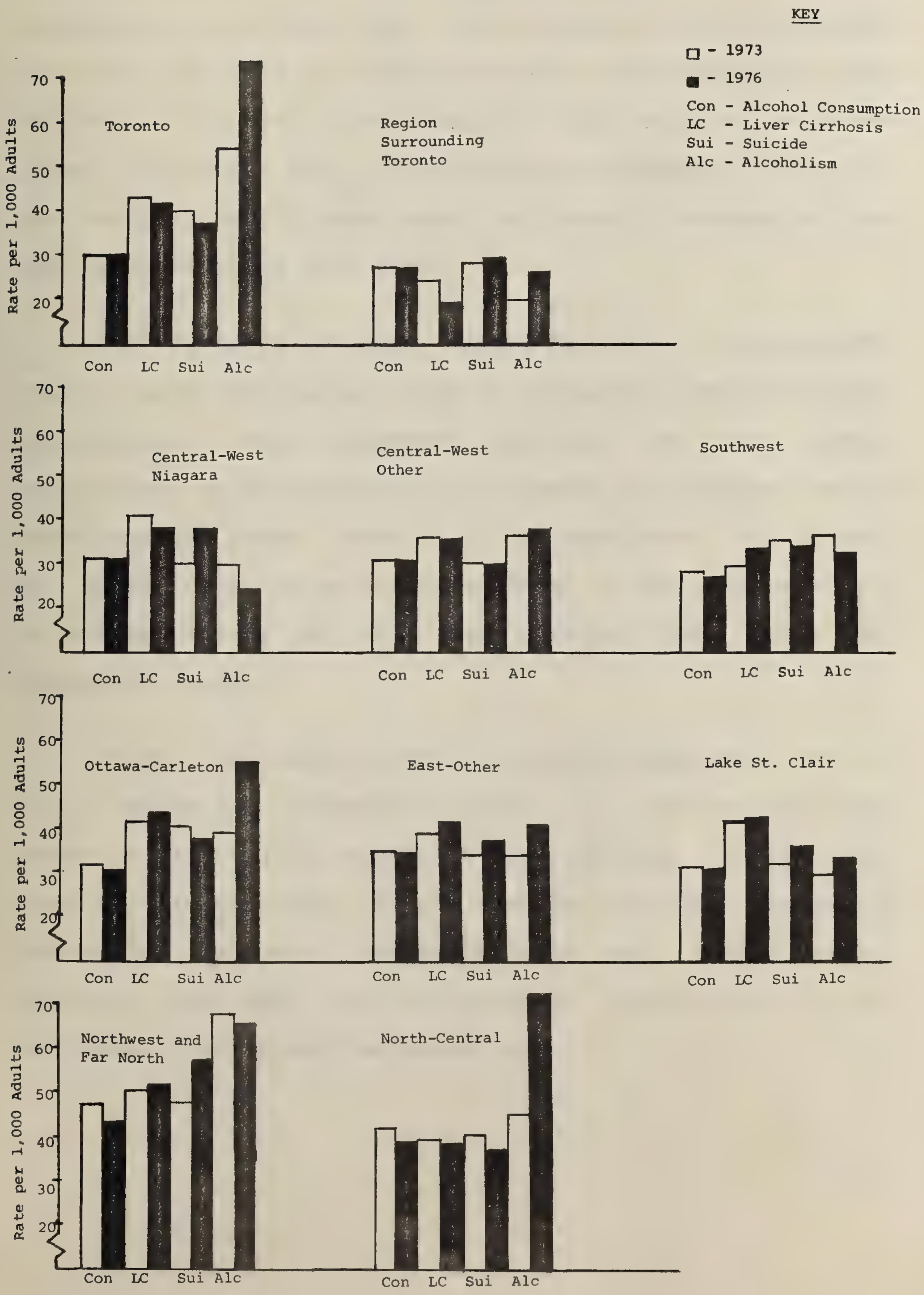
[1] All data based on a two year moving average, 1975-1977.

[2] See Appendix B for list of Counties, Districts and Regional Municipalities included within these Regions.

FIGURE 1: Comparison of 1973 and 1976 rates of alcoholism per 1,000 adults for 10 Ontario regions, by four methods of estimation: alcohol consumption, liver cirrhosis, suicide and alcoholism



by Single for 1973. With the exception of rates obtained by alcoholism mortality, the regional rates have remained reasonably stable over time. The variance of the difference between the 1973 and 1976 prevalence rate obtained by each method is 110.1 for alcoholism, 18.5 for suicide, 4.6 for liver cirrhosis and 1.1 for alcohol consumption. Thus, at the regional level, rates based on alcohol consumption are the least variable over time.

Two northern regions (North-Central, Northwest-Far North) show the largest drop in estimates based on alcohol consumption. These apparent declines can be largely attributed to differences in the number of drinkers used to calculate the rates. Single (1979a) considered 80 percent of Northerners to be drinkers while, in the present study, an updated figure of 84.5 was obtained from Smart and Goodstadt (1976).

As was also shown in our provincial comparisons of the four estimation procedures (Table 1), the regional rates based on alcoholism mortality are subject to the most temporal fluctuations. Figure 1 shows that three regions in particular (Toronto, Ottawa-Carleton and North-Central) account for most of the temporal variability in the estimates from alcoholism mortality.

II. 1979 alcoholism prevalence estimates for Ontario counties

Table 3 shows, for 1979, the estimated number of alcoholics and the prevalence rates for each Ontario county grouped within four administrative regions of the Foundation. The unadjusted figures are based on alcohol sales data and the Ledermann distribution, with the effects of tourism partialled out for some counties. The adjusted statistics in Table 3 are also based on alcohol consumption but take into account expected variation in prevalence estimates based on alternative methods. These adjusted rates are presented in Figure 2 to highlight regional and county variation.

Figure 2 shows the 1979 alcoholism prevalence rates for each Ontario county grouped within the Foundation regions. The regional rates for Western Ontario (36.3 per 1,000), Metro-Toronto (41.9 per 1,000) and Eastern Ontario (43.4 per 1,000) are very close to the provincial rate of 41.9 per 1,000. The Northern Region as a whole has a much higher rate of 55.8 per 1,000.

County variation within regions is the least for Western Ontario with the highest rate obtained for the most northerly county (Bruce). In the Metro-Toronto Region the rates show little deviation for the area immediately surrounding Metro with the highest rates obtained for Simcoe county and Metro itself.

TABLE 3: 1979 estimates of the number of alcoholics and prevalence rates per 1,000 adults by Ontario counties, grouped within four ARF regions

COUNTY	1979 Per Adult Consumption	Unadjusted Estimate		Adjusted Estimate	
		Number of Alcoholics	Rate	Number of Alcoholics	Rate
Dundas, Glengarry, Stormont	14.11	3,539	45.20	3,964	50.63
Frontenac	11.92	3,156	35.10	3,535	39.32
Haliburton[2]	14.79	400	48.02	448	53.78
Hastings	13.13	3,299	40.25	3,695	45.08
Lanark	12.22	1,296	36.33	1,452	40.70
Leeds/Grenville	11.89	2,205	34.98	2,470	39.18
Lennox/Addington	10.26	703	28.50	787	31.90
Northumberland	10.55	1,523	29.61	1,706	33.16
Ottawa-Carleton	11.42	14,140	33.07	19,089	44.64
Peterborough	13.09	3,136	40.08	3,512	44.89
Prescott/Russell	14.48	1,829	46.46	2,048	52.03
Prince Edward[2]	7.56	342	19.30	383	21.61
Renfrew	13.52	2,817	42.01	3,155	47.05
Victoria[2]	11.61	1,216	33.85	1,362	37.91
EASTERN REGION	12.09	39,601	36.03	47,606	43.31
Algoma	14.12	4,189	44.08	5,194	54.65
Cochrane	14.13	3,060	44.13	3,794	54.72
Kenora[2]	18.28	2,710	65.47	3,360	81.18
Manitoulin	16.23	438	54.54	543	67.61
Muskoka[2]	15.71	1,585	52.71	1,902	63.26
Nipissing	13.46	2,449	41.12	2,939	49.35
Parry Sound[2]	13.67	1,070	42.07	1,284	50.49
Rainy River	13.97	786	43.45	975	53.89
Sudbury District[2]	16.64	1,072	56.64	1,286	67.95
Sudbury Municipality	13.05	4,687	39.37	5,624	47.24
Thunder Bay	15.01	5,549	48.30	6,881	59.89
Timiskaming	12.38	1,159	36.55	1,437	45.32
NORTHERN REGION	14.36	28,754	45.53	35,219	55.77

TABLE 3. (Continued)

COUNTY	1979 Per Adult Consumption	Unadjusted Estimate		Adjusted Estimate	
		Number of Alcoholics	Rate	Number of Alcoholics	Rate
Brant	10.70	2,394	30.44	2,657	33.79
Bruce[2]	13.41	1,885	41.95	2,262	50.34
Dufferin	10.40	692	29.27	768	32.48
Elgin	9.26	1,350	25.43	1,566	29.50
Essex	11.77	8,438	34.82	9,788	40.39
Grey	10.72	1,731	30.53	2,077	36.63
Haldimand-Norfolk	10.68	2,120	30.40	2,353	33.74
Hamilton-Wentworth	11.07	10,443	31.96	11,592	35.48
Huron	10.39	1,251	29.24	1,451	33.91
Kent	11.89	2,889	35.31	3,351	40.95
Lambton	11.04	3,003	31.83	3,483	36.92
Middlesex	11.06	7,974	31.90	9,250	37.01
Niagara	11.40	9,490	33.29	10,154	35.62
Oxford	9.15	1,634	25.01	1,895	29.00
Perth	10.70	1,554	30.46	1,803	35.34
Waterloo	11.36	7,655	33.11	8,497	36.75
Wellington	9.95	2,790	27.55	3,097	30.58
WESTERN REGION	11.08	67,293	32.06	76,044	36.23
Durham	10.59	6,100	30.21	5,673	28.10
Halton	10.49	5,476	29.79	5,093	27.71
Peel	11.17	10,171	32.53	9,459	30.25
Simcoe	13.59	7,248	42.73	8,697	51.27
Metro-Toronto	10.98	53,646	31.64	81,542	48.09
York	9.05	4,143	24.77	3,853	23.03
METRO TORONTO REGION	10.98	86,784	31.78	114,317	41.86
TOTAL ONTARIO	11.53	222,432	33.91	273,186	41.64

[1] Litres of Absolute Alcohol

[2] Effects of tourism partialled out

FIGURE 2: Adjusted 1979 rates of alcoholism per 1,000 adults, by Ontario counties, grouped within four ARF regions

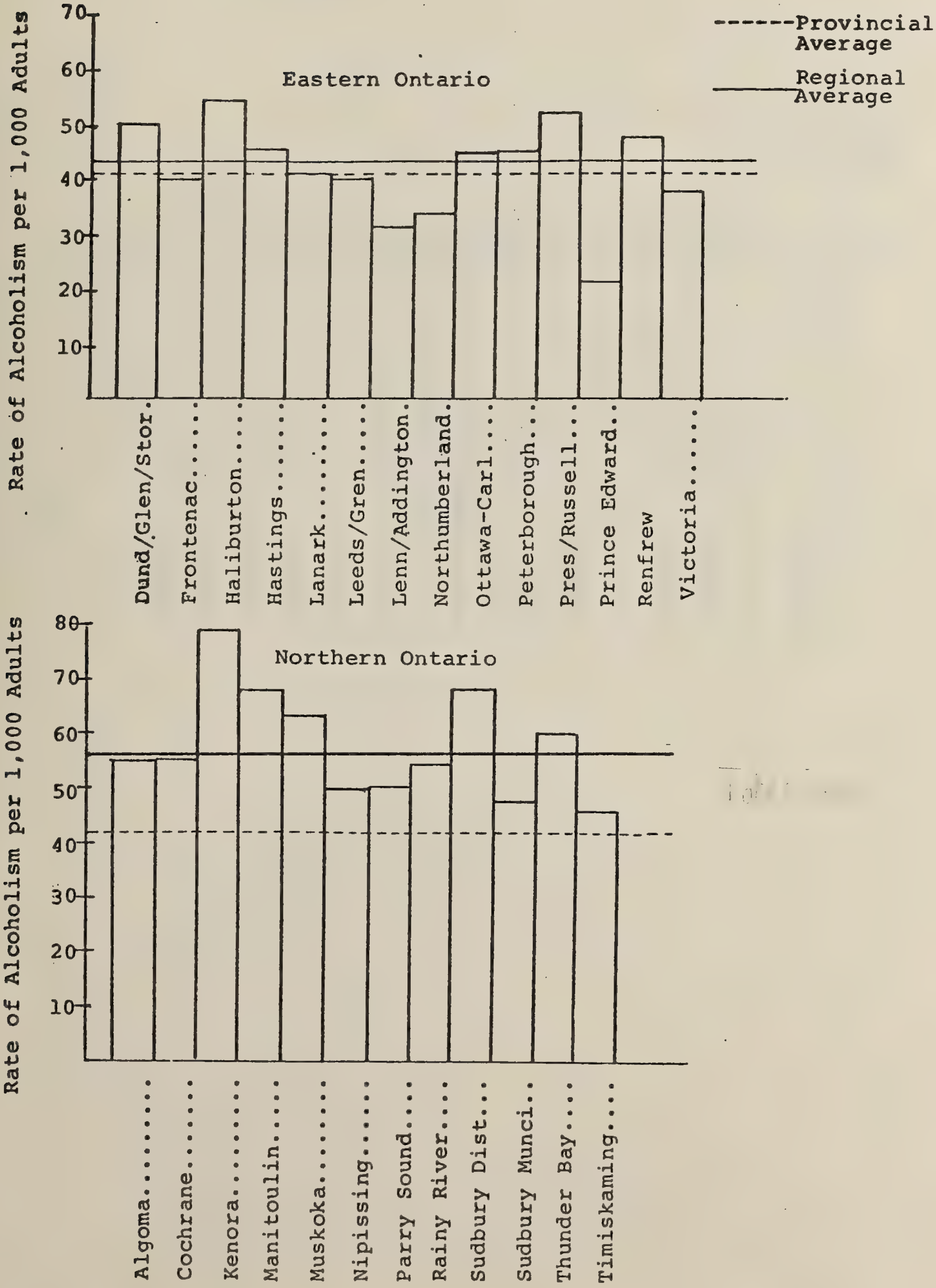
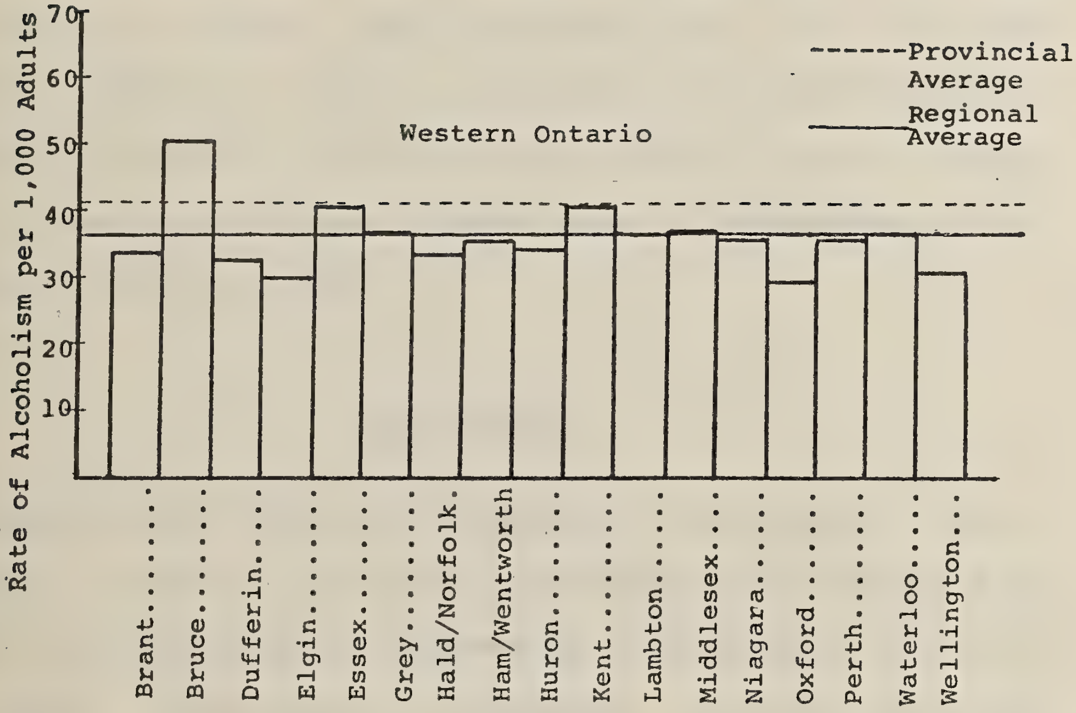
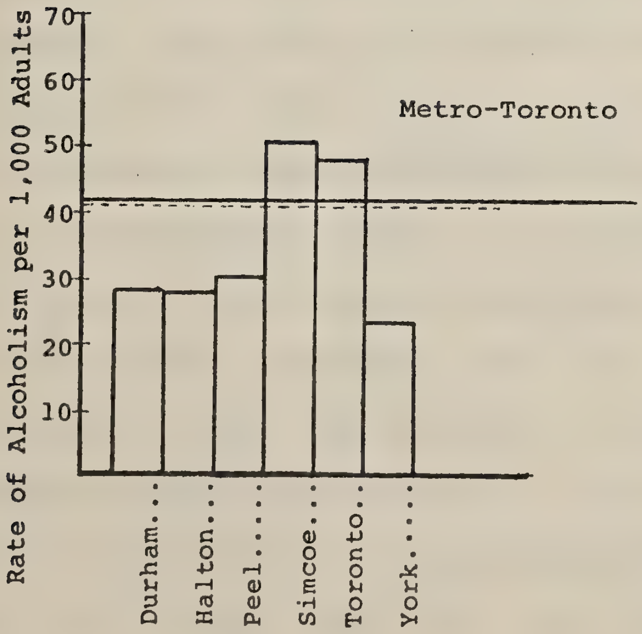


FIGURE 2. (Continued)





Variability between counties increases in both the Eastern and Northern regions. In the Eastern Region, the county of Haliburton obtained the highest rate, while Prince Edward County was lowest with a rate slightly more than half the regional average (See Reference Note 3). In the Northern region all counties obtained rates higher than the provincial average. The District of Kenora clearly stands out as the area with the highest rate of alcoholism in the province (81.2 per 1,000).

DISCUSSION

Alcohol sales data, the Ledermann distribution and a threshold criterion for heavy consumption were employed to estimate the prevalence of alcoholism in each Ontario county for 1979. Alternative estimation methods based on alcohol-related mortality were considered inappropriate at the county level since they require too large a population (at least 300,000) and rely on the recording of events that occur infrequently and with great variability. However, the prevalence estimates based on alcohol consumption were adjusted to take into account expected variation obtained by these alternative methods and to provide a rough approximation for the effects of tourism. While the consumption method was thought to be the most practical method of estimating the prevalence of alcoholism in each county, it does rest on a critical assumption. Specifically, one must assume that the Ledermann distribution of consumption is a valid descriptor of alcohol

consumption in each Ontario county. The extent to which this assumption is true, will determine the validity of our inter-county analysis.

The comparison of our 1976 prevalence estimates with estimates reported previously for 1966 (Schmidt and de Lint, 1970) and 1973 (Single, 1979) highlights two main points regarding the consumption method. First, the estimates obtained through this procedure are consistently more conservative than those yielded by other methods. Second, prevalence estimates based on alcohol consumption show the least variability from year to year in comparison to estimates based on alcohol-related mortality. This consistency was shown at both the provincial and regional level. Prevalence estimates based on deaths due to alcoholism show the most extreme fluctuations across regions, and over time, leading one to question the value of using this estimation procedure.

The county alcoholism prevalence estimates reported in Table 3 and Figure 2 should be useful for the planning and allocation of treatment resources in Ontario. There is an increasing demand at the regional and community level to demonstrate the need for additional resources prior to the funding of new treatment programs. In the U.S. this demand has been accompanied by specific legislative pressure (U.S. Public Law 94-371; California Senate Bill 744). Alcoholism prevalence estimates are used to estimate the size of the target population for treatment programs and are considered

an index of need for services.

Single (1979b) has questioned the allocation of treatment resources on the basis of prevalence estimates until such time as these estimates can be derived in a more reliable and valid fashion. Treatment data in particular, should not be used for this purpose since this would give unfair advantage to those areas with the most treatment facilities available. Although such concerns are valid, two important points should be noted. Firstly, with the increasing scarcity of treatment funds, the pressure from policy makers for local need assessments will continue. The application of alcohol sales data and the Ledermann distribution does provide the most stable estimates of prevalence and thus, will continue to be used to estimate the potential target population of alcoholism treatment resources. This is especially true for small geographic areas (Furst and Beckman, 1981).

Secondly, alcoholism prevalence estimates such as reported in this paper should not be the only indicator used in priortizing treatment service development on a provincial or regional basis. Rather, these estimates should be employed within a broader need assessment framework which draws on data from multiple sources (c.f. Gavin, 1981; Ford *et al.*, 1978).

CONCLUSION

This paper has approached the topic of alcoholism prevalence estimates with the view that the number of "cases" identified is influenced by the method of estimation employed. Furthermore, the various estimation procedures focus on different types of alcohol problems and are biased towards different types of heavy consumers. In a field where there are a wide variety of conceptualizations of alcoholism, some of them competing, the development of a "best" method for estimating prevalence is an unreasonable and inappropriate undertaking.

Given the conceptual and practical constraints outlined in the introduction to this report, the alcohol consumption method was nevertheless considered the more generally grounded estimation procedure. The general basis of this method of prevalence estimation is that it is linked rather directly to the behaviour that is a pre-condition for all types of alcohol problems - namely, the consumption of alcohol. While other methods of estimation vary in their reliability and validity, most are considered useful indicators. However, these alternative methods are more closely linked to specific types of problems (e.g. health consequences, deteriorated life-style) than is the case with the use of consumption data.

Despite the many caveats and qualifiers presented in the first part of the paper it would be misleading to

conclude with the conventional, and sometimes glib, statement that "more research is needed". In this paper, data have been presented for several geographic areas, for several points in time, and by four methods of estimating prevalence. In addition, the prevalence estimates based on alcohol consumption were subjected to a number of technical adjustments. Further work along these lines with current Ontario data is likely to be subject to the "law of diminishing returns". In our view, attention might now be directed to further understanding the local and regional variations in the complex relationship between alcohol availability, alcohol consumption, and alcohol-related damage.

REFERENCE NOTES

1. For the sake of readability, the term county is used throughout this paper as a catch-all term for counties (e.g. Middlesex), regional municipalities (e.g. Durham) and districts (e.g. Thunder Bay). A list of the geographical units under study is presented in Appendix B.

2. The reader is warned against the connotation of specificity inherent in these prevalence estimates. For example, Ontario prevalence estimates based on alcohol consumption will vary even with slight variations in statistical methodology. For example, provincial prevalence estimates may be estimated in two ways with alcohol sales data. One method is to make the necessary calculations on the total provincial alcohol sales. The second method is to apply the estimation formula to each county sales figure and then add the obtained prevalence figures to a provincial total. It seems to be an anomaly of the alcohol consumption method that the sum of the county estimates is always higher than an estimate obtained directly from total provincial sales (ie. the sum of the parts is always more than the whole). For example, in our 1976 data the number of alcoholics in Ontario obtained by using total alcohol sales is 190,367. Aggregating the 48

counties yields a higher estimate of 192,432 (see Appendix A, p. 53).

Other statistical procedures such as moving averages (see Table 2) also influence the Ontario prevalence estimates obtained from alcohol sales data.

3. It should be pointed out that the consumption rates for Prescott-Russell and Stormont-Dundas-Glengarry are higher than all their immediate neighbours in the Eastern region. The county data in Appendix A shows the highest variability in alcohol sales for these two areas with particularly extreme increases in sales for 1979. A 1979 strike closed the outlets of the Societe des alcools du Quebec for three months in the summer of 1979. This strike probably accounts for the large 1979 increase in alcohol sales for Prescott-Russell and Stormont-Dundas-Glengarry. The 1978 sales data is more representative of the alcohol consumption pattern in these two counties. The alcohol sales data for 1978 yield a prevalence rate of 28.15 and 27.01 per 1,000 adults for Dundas-Glengarry-Stormont and Prescott-Russell respectively. The 1978 adjusted prevalence rates (as in Figure 3) are 31.53 and 30.25 per 1,000.

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Appendix A

Ontario Statistics on Alcohol Sales,

Reported by County Boundaries for 1975-1979

County/District/
Regional Municipality:

YEAR

ALGOMA

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	1,162,493	1,138,790	1,219,342	1,259,067	1,341,441
Population ≥ 15	87,831	87,675	88,757	93,263	95,036
Per Adult Consumption (15 Years and over)	13.24	12.99	13.74	13.50	14.12
Per Drinker Consumption	15.66	15.37	16.26	15.98	16.70
Estimated Number of Alcoholics (Unadjusted)	3,529	3,430	3,762	3,854	4,189

BRANT

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	754,471	734,498	789,677	809,051	841,090
Population ≥ 15	73,765	73,870	75,364	77,476	78,638
Per Adult Consumption (15 Years and over)	10.23	9.94	10.48	10.44	10.70
Per Drinker Consumption	12.77	12.41	13.08	13.04	13.35
Estimated Number of Alcoholics (Unadjusted)	2,111	2,034	2,229	2,281	2,394

BRUCE

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	566,983	561,458	607,111	618,839	624,865
Population ≥ 15	40,533	41,980	42,327	44,258	44,938
Per Adult Consumption (15 Years and over)	13.99	13.37	14.34	13.98	13.91
Per Drinker Consumption	17.46	16.70	17.91	17.46	17.36
Estimated Number of Alcoholics (Unadjusted)	1,809	1,753	1,961	1,974	1,988

County/District/Regional Municipality:

YEAR

COCHRANE

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	942,356	918,011	943,408	912,937	979,482
Population ≥ 15	68,110	68,020	67,849	68,798	69,340
Per Adult Consumption (15 Years and over)	13.84	13.50	13.90	13.27	14.13
Per Drinker Consumption	16.37	15.97	16.46	15.70	16.72
Estimated Number of Alcoholics (Unadjusted)	2,917	2,809	2,927	2,775	3,060

DUFFERIN

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	187,216	180,583	204,068	223,076	245,788
Population ≥ 15	18,964	20,075	20,427	22,797	23,643
Per Adult Consumption (15 Years and over)	9.87	9.00	9.99	9.79	10.40
Per Drinker Consumption	12.32	11.23	12.47	12.22	12.98
Estimated Number of Alcoholics (Unadjusted)	517	491	566	614	692

DUNDAS/GLENGARRY/STORMONT

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	743,885	766,895	759,750	779,954	1,104,375
Population ≥ 15	73,538	73,540	74,201	76,717	78,291
Per Adult Consumption (15 Years and over)	10.12	10.43	10.24	10.17	14.11
Per Drinker Consumption	12.35	12.73	12.50	12.41	17.61
Estimated Number of Alcoholics (Unadjusted)	2,056	2,143	2,109	2,160	3,539

County/District/
Regional Municipality:

YEAR

DURHAM

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	1,707,875	1,673,484	1,886,018	2,018,767	2,138,193
Population ≥ 15	174,519	178,490	185,061	196,625	201,899
Per Adult Consumption (15 Years and over)	9.79	9.38	10.19	10.27	10.59
Per Drinker Consumption	12.40	11.88	12.92	13.01	13.42
Estimated Number of Alcoholics (Unadjusted)	4,727	4,630	5,298	5,686	6,100

ELGIN

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	450,964	433,431	466,763	479,330	491,855
Population ≥ 15	50,709	50,905	50,977	52,008	53,093
Per Adult Consumption (15 Years and over)	8.89	8.51	9.16	9.22	9.26
Per Drinker Consumption	11.10	10.63	11.43	11.51	11.57
Estimated Number of Alcoholics (Unadjusted)	1,221	1,164	1,276	1,313	1,350

ESSEX

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	2,512,343	2,446,028	2,565,818	2,665,037	2,853.397
Population ≥ 15	229,095	228,915	229,949	238,488	242,345
Per Adult Consumption (15 Years and over)	10.97	10.69	11.16	11.17	11.77
Per Drinker Consumption	13.69	13.34	13.93	13.95	14.70
Estimated Number of Alcoholics (Unadjusted)	7,223	6,960	7,427	7,718	8,438

County/District/ Regional Municipality:	YEAR				
	1975	1976	1977	1978	1979
FRONTENAC					
Total Litres of Absolute Alcohol	1,001,231	968,012	1,014,567	1,048,015	1,071,556
Population ≥ 15	81,925	82,635	85,974	88,744	89,908
Per Adult Consumption (15 Years and over)	12.22	11.71	11.80	11.81	11.92
Per Drinker Consumption	14.92	14.30	14.41	14.42	14.55
Estimated Number of Alcoholics (Unadjusted)	2,978	2,832	2,977	3,076	3,156
GREY					
Total Litres of Absolute Alcohol	556,933	551,436	589,382	602,835	607,640
Population ≥ 15	53,623	54,330	54,480	55,713	56,700
Per Adult Consumption (15 Years and over)	10.39	10.15	10.82	10.82	10.72
Per Drinker Consumption	12.97	12.67	13.51	13.51	13.38
Estimated Number of Alcoholics (Unadjusted)	1,567	1,538	1,685	1,724	1,731
HALDIMAND/NORFOLK					
Total Litres of Absolute Alcohol	708,666	682,598	721,802	731,403	745,097
Population ≥ 15	66,152	66,315	66,437	68,246	69,736
Per Adult Consumption (15 Years and over)	10.71	10.29	10.86	10.72	10.68
Per Drinker Consumption	13.37	12.85	13.56	13.38	13.34
Estimated Number of Alcoholics (Unadjusted)	2,019	1,914	2,068	2,084	2,120

County/District/ Regional Municipality:	YEAR				
	1975	1976	1977	1978	1979
HALIBURTON					
Total Litres of Absolute Alcohol	140,791	136,717	145,479	145,681	151,999
Population ≥ 15	8,064	8,320	8,376	8,060	8,330
Per Adult Consumption (15 Years and over)	17.46	16.43	17.37	18.07	18.25
Per Drinker Consumption	21.32	20.06	21.21	22.07	22.28
Estimated Number of Alcoholics (Unadjusted)	500	468	515	527	564
HALTON					
Total Litres of Absolute Alcohol	1,575,169	1,550,861	1,724,324	1,809,536	1,927,384
Population ≥ 15	159,198	164,650	166,109	179,050	183,815
Per Adult Consumption (15 Years and over)	9.89	9.42	10.38	10.11	10.49
Per Drinker Consumption	12.54	11.94	13.16	12.81	13.29
Estimated Number of Alcoholics (Unadjusted)	4,378	4,297	4,879	5,068	5,476
HAMILTON-WENTWORTH					
Total Litres of Absolute Alcohol	3,394,009	3,271,262	3,444,728	3,536,964	3,618,285
Population ≥ 15	312,296	312,510	313,760	322,831	326,726
Per Adult Consumption (15 Years and over)	10.87	10.47	10.98	10.96	11.07
Per Drinker Consumption	13.57	13.07	13.71	13.68	13.83
Estimated Number of Alcoholics (Unadjusted)	9,724	9,230	9,909	10,166	10,443

County/District/ Regional Municipality:

YEAR

HASTINGS

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	1,004,295	965,375	1,035,562	1,056,358	1,076,310
Population ≥ 15	77,846	78,565	78,776	80,738	81,967
Per Adult Consumption (15 Years and over)	12.90	12.29	13.15	13.08	13.13
Per Drinker Consumption	15.75	15.00	16.05	15.98	16.03
Estimated Number of Alcoholics (Unadjusted)	3,056	2,877	3,176	3,233	3,299

HURON

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	388,603	377,692	410,827	419,763	444,571
Population ≥ 15	40,852	41,170	41,205	41,695	42,784
Per Adult Consumption (15 Years and over)	9.51	9.17	9.97	10.07	10.39
Per Drinker Consumption	11.88	11.45	12.45	12.57	12.97
Estimated Number of Alcoholics (Unadjusted)	1,075	1,033	1,139	1,168	1,251

KENORA

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	682,139	651,204	676,647	782,197	756,542
Population ≥ 15	38,996	39,520	39,317	40,858	41,390
Per Adult Consumption (15 Years and over)	17.49	16.48	17.21	19.14	18.28
Per Drinker Consumption	20.70	19.50	20.37	22.66	21.63
Estimated Number of Alcoholics (Unadjusted)	2,381	2,204	2,339	2,878	2,710

County/District/
Regional Municipality:

YEAR

KENT

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	848,778	824,056	882,318	928,848	973,243
Population ≥ 15	77,447	77,945	77,993	80,218	81,824
Per Adult Consumption (15 Years and over)	10.96	10.57	11.31	11.58	11.89
Per Drinker Consumption	13.68	13.20	14.12	14.46	14.85
Estimated Number of Alcoholics (Unadjusted)	2,440	2,335	2,568	2,729	2,889

LAMBTON

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	956,695	965,339	1,026,293	1,042,732	1,041,633
Population ≥ 15	88,461	89,090	90,494	93,082	94,334
Per Adult Consumption (15 Years and over)	10.81	10.84	11.34	11.20	11.04
Per Drinker Consumption	13.50	13.53	14.16	13.99	13.79
Estimated Number of Alcoholics (Unadjusted)	2,736	2,762	2,990	3,023	3,003

LANARK

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	401,380	386,712	412,507	425,866	435,840
Population ≥ 15	33,644	33,830	34,012	35,070	35,673
Per Adult Consumption (15 Years and over)	11.93	11.43	12.13	12.14	12.22
Per Drinker Consumption	14.57	13.96	14.81	14.83	14.92
Estimated Number of Alcoholics (Unadjusted)	1,183	1,120	1,223	1,264	1,296

County/District/
Regional Municipality:

YEAR

LEEDS/GRENVILLE

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	644,874	613,078	649,459	695,811	749,226
Population ≥ 15	58,683	59,115	59,450	61,479	63,035
Per Adult Consumption (15 Years and over)	10.99	10.37	10.92	11.32	11.89
Per Drinker Consumption	13.42	12.66	13.34	13.82	14.51
Estimated Number of Alcoholics (Unadjusted)	1,839	1,710	1,848	2,008	2,205

LENNOX/ADDINGTON

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	236,825	223,570	237,690	244,281	253,090
Population ≥ 15	23,077	23,650	23,965	24,259	24,668
Per Adult Consumption (15 Years and over)	10.26	9.45	9.92	10.07	10.26
Per Drinker Consumption	12.53	11.54	12.11	12.30	12.53
Estimated Number of Alcoholics (Unadjusted)	658	613	652	674	703

MANITOULIN

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	124,135	117,745	127,559	126,870	146,436
Population ≥ 15	7,712	7,670	7,722	7,973	8,031
Per Adult Consumption (15 Years and over)	16.10	15.35	16.52	15.91	18.23
Per Drinker Consumption	19.05	18.17	19.55	18.83	21.58
Estimated Number of Alcoholics (Unadjusted)	415	383	432	421	524

County/District/ Regional Municipality:	YEAR				
	1975	1976	1977	1978	1979
MIDDLESEX					
Total Litres of Absolute Alcohol	2,457,645	2,398,510	2,570,277	2,672,054	2,764,437
Population ≥ 15	227,018	229,630	237,405	244,471	249,955
Per Adult Consumption (15 Years and over)	10.83	10.45	10.83	10.93	11.06
Per Drinker Consumption	13.52	13.04	13.52	13.65	13.81
Estimated Number of Alcoholics (Unadjusted)	7,030	6,761	7,353	7,673	7,974
MUSKOKA					
Total Litres of Absolute Alcohol	524,076	504,436	539,546	543,851	582,976
Population ≥ 15	27,426	28,095	28,075	29,658	30,068
Per Adult Consumption (15 Years and over)	19.11	17.95	19.22	18.34	19.39
Per Drinker Consumption	23.33	21.92	23.47	22.39	23.67
Estimated Number of Alcoholics (Unadjusted)	1,965	1,821	2,033	1,987	2,206
NIAGARA					
Total Litres of Absolute Alcohol	2,960,519	2,874,970	3,042,081	3,130,398	3,250,316
Population ≥ 15	271,288	273,125	273,763	281,539	285,086
Per Adult Consumption (15 Years and over)	10.91	10.53	11.11	11.12	11.40
Per Drinker Consumption	13.62	13.14	13.87	13.88	14.23
Estimated Number of Alcoholics (Unadjusted)	8,496	8,131	8,791	9,049	9,490

County/District/
Regional Municipality:

YEAR

NIPISSING

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	777,432	747,308	782,316	785,219	801,352
Population ≥ 15	58,085	58,295	57,098	58,675	59,549
Per Adult Consumption (15 Years and over)	13.38	12.82	13.70	13.38	13.46
Per Drinker Consumption	15.84	15.17	16.21	15.84	15.93
Estimated Number of Alcoholics (Unadjusted)	2,371	2,238	2,411	2,395	2,449

NORTHUMBERLAND

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	475,169	464,606	615,167	520,171	542,765
Population ≥ 15	47,645	48,290	48,337	50,669	51,444
Per Adult Consumption (15 Years and over)	9.97	9.62	12.73	10.27	10.55
Per Drinker Consumption	12.18	11.75	15.54	12.53	12.88
Estimated Number of Alcoholics (Unadjusted)	1,306	1,281	1,861	1,445	1,523

OTTAWA-CARLETON

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	4,344,889	4,262,488	4,446,730	4,550,729	4,883,191
Population ≥ 15	392,551	398,945	405,659	416,221	427,574
Per Adult Consumption (15 Years and over)	11.07	10.68	10.96	10.93	11.42
Per Drinker Consumption	13.51	13.05	13.38	13.35	13.94
Estimated Number of Alcoholics (Unadjusted)	12,428	12,018	12,671	12,953	14,140

County/District/
Regional Municipality:

YEAR

	1975	1976	1977	1978	1979
OXFORD					
Total Litres of Absolute Alcohol	518,831	509,076	551,662	570,227	597,823
Population ≥ 15	62,558	63,075	62,977	64,160	65,334
Per Adult Consumption (15 Years and over)	8.29	8.07	8.76	8.89	9.15
Per Drinker Consumption	10.35	10.08	10.94	11.10	11.42
Estimated Number of Alcoholics (Unadjusted)	1,383	1,347	1,492	1,544	1,634
PARRY SOUND					
Total Litres of Absolute Alcohol	381,108	363,440	387,101	385,831	401,458
Population ≥ 15	24,215	24,505	24,680	24,439	25,432
Per Adult Consumption (15 Years and over)	15.74	14.83	15.68	15.79	15.79
Per Drinker Consumption	18.63	17.55	18.56	18.68	18.68
Estimated Number of Alcoholics (Unadjusted)	1,257	1,163	1,274	1,275	1,326
PEEL					
Total Litres of Absolute Alcohol	2,730,552	2,707,958	3,009,216	3,221,836	3,491,576
Population ≥ 15	248,916	264,070	282,075	303,716	312,666
Per Adult Consumption (15 Years and over)	10.97	10.25	10.67	10.61	11.17
Per Drinker Consumption	13.90	13.00	13.52	13.44	14.15
Estimated Number of Alcoholics (Unadjusted)	7,898	7,623	8,609	9,197	10,171

County/District/
Regional Municipality:

YEAR

PERTH

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	508,834	486,928	517,171	530,055	545,899
Population ≥ 15	48,873	49,225	49,445	50,376	51,023
Per Adult Consumption (15 Years and over)	10.41	9.89	10.46	10.52	10.70
Per Drinker Consumption	13.00	12.35	13.06	13.14	13.36
Estimated Number of Alcoholics (Unadjusted)	1,432	1,346	1,459	1,499	1,554

PETERBOROUGH

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	962,710	922,514	982,985	996,117	1,024,318
Population ≥ 15	74,673	75,595	75,441	76,961	78,239
Per Adult Consumption (15 Years and over)	12.89	12.20	13.03	12.94	13.09
Per Drinker Consumption	15.74	14.90	15.91	15.80	15.99
Estimated Number of Alcoholics (Unadjusted)	2,929	2,742	3,003	3,035	3,136

PRESCOTT AND RUSSELL

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	365,915	393,293	370,954	371,833	569,795
Population ≥ 15	34,629	35,220	36,272	37,684	39,363
Per Adult Consumption (15 Years and over)	10.57	11.17	10.23	9.87	14.48
Per Drinker Consumption	12.90	13.63	12.49	12.05	17.67
Estimated Number of Alcoholics (Unadjusted)	1,027	1,129	1,029	1,018	1,829

County/District/
Regional Municipality:

YEAR

PRINCE EDWARD

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	126,654	118,742	128,841	131,590	135,254
Population ≥ 15	16,959	17,195	17,346	17,036	17,720
Per Adult Consumption (15 Years and over)	7.47	6.91	7.43	7.72	7.63
Per Drinker Consumption	9.12	8.43	9.07	9.43	9.32
Estimated Number of Alcoholics (Unadjusted)	322	298	327	337	346

RAINY RIVER

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	249,193	237,750	251,530	255,371	252,819
Population ≥ 15	17,865	17,640	17,299	17,801	18,091
Per Adult Consumption (15 Years and over)	13.95	13.48	14.54	14.35	13.97
Per Drinker Consumption	16.51	15.95	17.21	16.98	16.54
Estimated Number of Alcoholics (Unadjusted)	774	727	797	803	786

RENFREW

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	865,225	831,988	879,710	905,852	906,673
Population ≥ 15	66,173	65,680	64,910	66,566	67,060
Per Adult Consumption (15 Years and over)	13.08	12.67	13.55	13.61	13.52
Per Drinker Consumption	15.96	15.47	16.55	16.62	16.51
Estimated Number of Alcoholics (Unadjusted)	2,647	2,512	2,736	2,822	2,817

County/District/
Regional Municipality:

YEAR

SIMCOE

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	2,024,614	1,975,253	2,122,606	2,197,391	2,305,200
Population ≥ 15	150,499	155,485	157,135	166,532	169,626
Per Adult Consumption (15 Years and over)	13.45	12.70	13.51	13.20	13.59
Per Drinker Consumption	16.79	15.86	16.86	16.47	16.97
Estimated Number of Alcoholics (Unadjusted)	6,338	6,028	6,657	6,820	7,248

SUDBURY DISTRICT

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	284,556	271,656	299,341	283,450	317,121
Population ≥ 15	19,060	18,745	18,515	18,758	18,926
Per Adult Consumption (15 Years and over)	14.93	14.49	16.17	15.11	16.76
Per Drinker Consumption	17.67	17.15	19.13	17.88	19.83
Estimated Number of Alcoholics (Unadjusted)	913	859	1,003	915	1,083

SUDBURY MUNICIPALITY

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	1,526,609	1,493,537	1,570,455	1,559,319	1,553,231
Population ≥ 15	118,909	118,320	117,975	118,328	119,058
Per Adult Consumption (15 Years and over)	12.84	12.62	13.31	13.18	13.05
Per Drinker Consumption	15.19	14.94	15.75	15.60	15.44
Estimated Number of Alcoholics (Unadjusted)	4,575	4,444	4,779	4,725	4,687

County/District/
Regional Municipality: YEAR

THUNDER BAY

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	1,615,955	1,683,517	1,666,031	1,688,902	1,724,376
Population $\geq$ 15	111,290	111,695	110,564	113,733	114,895
Per Adult Consumption (15 Years and over)	14.52	15.07	15.07	14.85	15.01
Per Drinker Consumption	17.18	17.84	17.83	17.57	17.76
Estimated Number of Alcoholics (Unadjusted)	5,114	5,429	5,372	5,406	5,549

TIMISKAMING

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	392,357	370,462	387,027	386,955	392,552
Population $\geq$ 15	32,451	31,960	30,873	31,308	31,711
Per Adult Consumption (15 Years and over)	12.09	11.59	12.54	12.36	12.38
Per Drinker Consumption	14.31	13.72	14.84	14.63	14.65
Estimated Number of Alcoholics (Unadjusted)	1,148	1,066	1,149	1,142	1,159

TORONTO

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	18,025,341	17,300,947	18,173,788	18,247,522	18,620,377
Population $\geq$ 15	1,655,288	1,658,155	1,658,195	1,683,168	1,695,603
Per Adult Consumption (15 Years and over)	10.89	10.43	10.96	10.84	10.98
Per Drinker Consumption	13.73	13.16	13.82	13.67	13.85
Estimated Number of Alcoholics (Unadjusted)	51,887	48,954	52,445	52,435	53,646

County/District/
Regional Municipality:

YEAR

VICTORIA

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	432,580	409,447	436,184	439,978	463,849
Population $\geq$ 15	32,023	33,020	34,190	35,040	35,927
Per Adult Consumption (15 Years and over)	13.51	12.40	12.76	12.56	12.91
Per Drinker Consumption	16.49	15.14	15.58	15.33	15.76
Estimated Number of Alcoholics (Unadjusted)	1,343	1,225	1,321	1,324	1,412

WATERLOO

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	2,357,631	2,302,672	2,448,126	2,543,669	2,625,850
Population $\geq$ 15	207,953	212,600	217,846	226,873	231,214
Per Adult Consumption (15 Years and over)	11.34	10.83	11.24	11.21	11.36
Per Drinker Consumption	14.15	13.52	14.03	14.00	14.18
Estimated Number of Alcoholics (Unadjusted)	6,868	6,588	7,106	7,376	7,655

WELLINGTON

	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	900,638	874,839	929,156	971,344	1,007,472
Population $\geq$ 15	89,409	91,425	94,310	99,149	101,288
Per Adult Consumption (15 Years and over)	10.07	9.57	9.85	9.80	9.95
Per Drinker Consumption	12.58	11.95	12.30	12.23	12.42
Estimated Number of Alcoholics (Unadjusted)	2,506	2,424	2,564	2,675	2,790

County/District/ Regional Municipality:

YEAR

YORK	1975	1976	1977	1978	1979
Total Litres of Absolute Alcohol	1,319,986	1,277,771	1,372,696	1,445,087	1,513.846
Population ≥ 15	142,337	147,815	151,432	162,789	167,279
Per Adult Consumption (15 Years and over)	9.27	8.64	9.06	8.88	9.05
Per Drinker Consumption	11.75	10.96	11.49	11.25	11.47
Estimated Number of Alcoholics (Unadjusted)	3,640	3,548	3,759	3,931	4,143

ONTARIO TOTAL					
Total Litres of Absolute Alcohol	68,822,128	66,922,943	71,021,796	72,697,969	75,893,864
Population ≥ 15	6,123,133	6,190,590	6,254,799	6,454,096	6,560,275
Per Adult Consumption (15 Years and over)	11.24	10.81	11.35	11.26	11.57
Per Drinker Consumption	13.96	13.42	14.09	13.98	14.37
Estimated Number of Alcoholics (Unadjusted)	200,656	192,432	207,956	212,199	223,873

Appendix B

Counties, Regional Municipalities and Districts

Aggregated to 10 Ontario Regions

GEOGRAPHIC BREAKDOWN OF THE 10 ONTARIO REGIONS EMPLOYED IN TABLE 2

REGION	BOROUGHS, COUNTIES, DISTRICTS, REGIONAL MUNICIPALITIES
1. Metro Toronto	Scarborough, North York, Toronto, York, East York, Etobicoke
2. Region Surrounding Toronto	Halton, Peel, York, Durham
3. Lake St. Clair	Essex, Kent, Lambton
4. Central West: Niagara	Niagara
5. Central West: Other	Brant, Dufferin, Haldimand/Norfolk, Waterloo Wellington, Hamilton/Wentworth
6. Southwest	Middlesex, Elgin, Oxford, Perth, Huron
7. East: Ottawa-Carleton	Ottawa-Carleton
8. East: Other	Haliburton, Hastings, Northumberland, Peterborough, Prince Edward, Victoria, Stormont-Dundas-Glengarry, Frontenac, Lanark-Leeds-Grenville, Lennox-Addington, Prescott-Russell, Renfrew
9. North-Central	Muskoka, Nipissing, Parry Sound, Simcoe, Bruce, Grey, Sudbury (District), Sudbury (R.M.)
10. Northwest and Far North	Algoma, Cochrane, Kenora, Rainy River, Manitoulin, Thunder Bay, Timiskaming

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